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CLINICAL APPLICATION OF RADIOACTIVE ISOTOPES IN THE USSR

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Radioactive isotopes are being used at medical institutions of the USSR for the treatment of various diseases. However, these isotopes have acquired the greatest importance in the therapy of malignant and benignant neoplasms. Among the various radioactive isotopes, radioactive cobalt, phosphorus, iodine, and gold have been used most extensively for the purposes mentioned.

The centralization of the distribution of radioactive isotopes in an extensive network of medical institutions and the ready availability of medical service which is given without any charge have made it possible to carry out during a comparatively short period clinical observations on a great number of patients. One hundred sixty oncological institutions of the USSR have received almost simultaneously assortments of preparations of radioactive cobalt for therapeutic purposes. With the aid of the preparations supplied, the therapy of patients suffering from various forms of malignant tumors has been carried out. It has been established in this connection that the immediate and remote results obtained by this method of treatment are not inferior to those obtained when natural radioactive substances are used.

In the treatment of tumors of the tracheal ring with radium-mesothorium at the State Oncological Institute imeni T. A. Gertsen, a cure resulting directly from the treatment was obtained in 61% of the cases, while in treatment with radioactive cobalt a cure was obtained in 70% of the cases. In the treatment of cancer of the throat in the first and second stages, a lasting cure was obtained in 73% of the cases with radium-mesothorium and in 77% of cases with radioactive cobalt. In the treatment of metastases of cancer of the breast affecting the region above the clavicle, cures were obtained in 22% of the cases with radium-mesothorium and in 36% of the cases with radioactive cobalt.

In the treatment of patients suffering from malignant neoplasms which have a low sensitivity to radium or to radiation ["a low radiosensitivity"], combinations of various methods of radiation therapy are used which make it possible to expose the site of the affliction to the necessary amount of radiation with the least possible damage to healthy tissues surrounding the tumor.

In order to reduce the local manifestations of the reaction to irradiation in therapy of tumors of the upper and lower jaw, the oral cavity, the cranium, and the lower lip, the most effective measure proved to be the application of bilateral momentary tying up of the external carotid arteries. Observations carried out on 340 patients showed the absence of any complications whatever in connection with this operation. The resistance of the skin to the effects of radiation is increased on the average by 50%. The interruption of the flow of blood supplied to the tumor leads to its degeneration, so that the sensitivity of the tumor to the radiation is increased.

In the USSR artificial radioactive isotopes with a short half-life are prepared which can be introduced directly into the tumor. The radioactive substance is prepared in the form of a suspension of an insoluble salt or in the form of a colloidal solution. A method has been evolved of determining the radioactivity in the tissues of the body by measuring the X-ray "Bremsstrahlung." Observations which have been carried out show that the action of the radioactive isotope is

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restricted in the majority of cases to the site of the application. During the time when the isotope is present in the tumor, the amount of radiation which is emitted in the course of the decay of the isotope reaches a level that is sufficient for destroying even tumors which are most resistant to radiation. No damage to the healthy tissues surrounding the tumor takes place. Among the isotopes which are available, the most suitable for the treatment of malignant neoplasms are radioactive colloidal gold and to a lesser degree radioactive chromium phosphate.

Observations which had been carried out on 47 patients suffering from forms of neoplasms which are least susceptible to treatment (recurrences of cancer after radiation therapy, metastases not susceptible to surgery or repeated radiation therapy, and metastases of malignant melanomas) demonstrated that introduction of the isotope into the tumor leads to the tumor's regression. Thus, after treatment of 11 cases of metastases of malignant melanoma with this method, there was no further spread of the process in eight cases. Observations on the patients were carried out for periods extending up to 2 years. Among patients who had had recurrences of cancer tumors, recovery took place in approximately 50% of the cases.

In the treatment of cancer of the urinary bladder, external irradiation is used. A dose of about 7,000 roentgen is applied followed by the infiltration of the tumor with a solution of colloidal gold or a suspension of chromium phosphate.

In the tele-cobalt therapy of 450 children with cavernous angiomas, a good therapeutic effect was obtained in 92% of the cases.

The treatment of malignant neoplasms of the eyelids, sclera, conjunctiva, and the cornea with radioactive phosphorus by the method of external irradiation makes it possible to achieve recovery without damaging the eyes. It is known that hitherto, whenever neoplasms were located on these parts of the eye, only surgery involving removal of the eye was successful.

External application of radioactive phosphorus in precancer conditions of the skin results in a cure in almost 100% of the cases.

Soviet dermatologists have used the external application of radioactive isotopes to treat various diseases of the skin. Radioactive phosphorus was used principally for the therapy of capillary angiomas, neurodermatites, and other diseases of the skin. The best results were obtained when young children were treated.

In the treatment of a group consisting of 733 patients suffering from erythemosquamous dermatites, good results were obtained in 60% of the cases. There was rapid disappearance of the itching followed by a resorption of the inflammation infiltrate. In the therapy of local eczemas, lasting cures were obtained in 50% of the cases. The patients were under observation for 3 years and no regression was observed during that time.

Various methods of radiation therapy are being extensively applied in the USSR for the treatment of malignant diseases of the blood. Thus, radioactive phosphorus proved to be the most effective means of treating erythremia.

Of great importance was work aiming at the achievement of lasting remissions by the treatment of erythremia with small doses of radioactive phosphorus. It is known that the administration of even relatively small doses of radioactive phosphorus (8-9 millicuries per course of treatment) may sometimes bring about anemia, leukopenia, and thrombocytopenia. N. V. Nikolayeva has shown that it is advisable to apply a bloodletting prior to the administration of radioactive phosphorus and

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to transfuse plasma later. It is advisable to apply doses amounting to 4 millicuries of radioactive phosphorus per course of treatment in connection with this method. After treatment by this method an improvement in the condition 122 patients took place during the first few weeks following the treatment. Prolonged remissions extending over 1-3 years were obtained in the cases of 120 patients. A contraindication to this method of treating erythremia is a pronounced tendency towards thromboangiitis.

Contemporary clinical medicine does not have at its disposal effective methods for the therapy of acute leukoses. In some cases the application of many-sided therapy that includes administration of antibiotics, frequent transfusions of erythrocytic mass, and administration of pituitary hormones, hormones of the suprarenal cortex, and ascorbic acid leads to a temporary alleviation of the symptoms of the disease and a certain extension of the life of the patient.

On the basis of experience acquired in the use of radioactive phosphorus in the treatment of a great number of patients suffering from chronic leukoses, Soviet scientists have reached the conclusion that this isotope yields a better therapeutic effect in cases of chronic lymphadenosis than in those of chronic myelosis. The investigators who have studied this question regard as expedient, particularly for the treatment of the myeloid form of leukoses, the administration of radioactive phosphorus in combination with X-ray therapy. The spleen or individual major lymphatic nodes are subjected to irradiation with doses of 100-150 roentgen, applied 2 to 3 times per week.

In the treatment of leukoses complicated by anemia and also in order to prevent the development of anemia, hemotherapy, particularly in the form of transfusions of erythrocytic mass, is used extensively in the USSR. In addition to hemotherapy, the administration of hormones is used in the treatment of leukoses.

Radioactive iodine is applied in the therapy of some diseases of the thyroid gland. Thus, in the therapy of various forms of hyperthyroidism (toxic diffuse hyperthyroidism, toxic nodular hyperthyroidism, etc.), administration of radioactive iodine results in an appreciable alleviation of the symptoms of the disease or complete disappearance of these symptoms. Soviet medical men use I^{131} in doses not exceeding 6-8 millicuries. Doses of this magnitude do not bring about hypothyroidism or any other complications.

To summarize, experience acquired in work done by Soviet scientists in the field of medical radiology leads to the conclusion that the therapeutic application of radioactive isotopes is of great value and shows considerable promise.

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